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A STUDY TO IDENTIFY THE CHEST EXPANSION VALUES AND PEFR VALUES AMONG CONSTRUCTION WORKERS

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ABSTRACT

Chest expansion measurements were used to evaluate a patient's baseline status, treatment effectiveness, and progression of disease with regards to chest wall mobility and respiratory muscle function. Peak expiratory flow rate (PEFR) is the maximum flow rate generated during a forceful exhalation, starting from full lung inflation with the help of peak expiratory flow meter. Chest expansion was measured at two levels i.e. axillary and xiphoid process and the mean values of the two levels were recorded. This was followed by measuring Peak expiratory flow rate (PEFR) where the subject is asked to deeply inspire and exhale through the Peak expiratory flow meter. The purpose of the study is to find out the chest expansion and PEFR values among construction workers.

KEY WORDS:Chest Expansion, Peak expiratory Flow Rate (PEFR), Construction Workers

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INTRODUCTION

Chest expansion measurements are used to evaluate a patient's baseline status, treatment effectiveness, and progression of disease with regards to chest wall mobility and respiratory muscle function.[1]Physical therapy plays a major role for a variety of patients with respiratory diseases with the use of techniques such as chest percussion, postural drainage, chest vibration, cough maneuver, breathing exercises, relaxation techniques and endurance exercises Although, the rationale and validity of many of these interventions has been challenged. Little attention was placed to evaluating a group of patients with the specific lung disease to determine the efficacy of chest physical therapy. In patient with pulmonary diseases, chest expansion evaluation provides baseline values for comparison to assess the efficacy of the intervention.[2] Physiotherapy professionals commonly use Chest expansion measurements to evaluate the effect that restrictive pulmonary diseases, such as Ankylosing spondylitis, idiopathic scoliosis, muscular dystrophy, spinal cord injuries, and obstructive diseases such as chronic obstructive pulmonary diseases, have on chest wall range of motion. Chest expansion is also an indicator of respiratory muscle function in patients with Rheumatologic disease. [3, 4] In the clinical setting, a simple and inexpensive technique for measuring chest expansion is a tape measure which has been shown to be reliable in healthy volunteers.[5] Peak expiratory flow rate (PEFR) is the maximum flow rate generated during a forceful exhalation, starting from full lung inflation with the help of peak expiratory flow meter. Peak flow rate primarily reflects the large airway flow and depends on the voluntary effort and muscular strength of the patient. Maximal airflow occurs during the effort-dependent portion of the expiratory maneuvre, so low values may be caused by a less than maximal effort rather than by airway obstruction, Nevertheless, the ease of measuring peak flow rate with an inexpensive small portable device has made it popular as a means of following the degree of airway obstruction in patients with Asthma and other pulmonary conditions. These pressures, generated by the inspiratory and expiratory Muscles, are responsible for volume changes in the respiratory system.The construction workers are more exposed to cement and sand. Continuous inhalation of cement and silica is harmful to the lungs. In this respect, the construction workers are at more prone to continuous exposure to cement and silica due to the nature of their job. According to many studies prevalence of restrictive, obstructive & mixed type of functional impairment of lung was found to have direct relationship with concentration of cement and silica. Exposure to respirable crystalline silica dust during construction activities can cause serious and fatal respiratory disease. The national institute for occupational safety and health (NIOSH) requests assistant in preventing silicosis and death in construction workers exposed to respirable silica, when workers inhale crystalline silica, the lung tissue react by developing fibrotic nodules and scarring around the trapped silica particles.[6,7] .The purpose of this study is to find out the chest expansion values and peak expiratory flow rate (PEFR) values among construction workers.

MATERIALS AND METHODS

INCLUSION CRITERIA

Construction Workers of age group 30-60 years.
Subjects of either gender

EXCLUSION CRITERIA

History of any diagnosed respiratory illness,
Thoracic abnormality Any chest trauma (as ribs fractures)

MATERIALS REQUIRED

Inch tape, peak expiratory flow rate meter100 Construction workers of either gender were recruited in the study. Informed consent was obtained from all the subjects. The procedure was explained to the subjects before the study. Age and gender of the subjects were recorded before the procedure.During the chest expansion measurements the subject stands with hands on the hips. Chest expansion was measured at an axillary level and the xiphoid process. One end was kept at 0 point of the tape fixed on the midline of the body, horizontally aligned with the landmarks, while the other end of the tape was not allowed to move. The tape was snug but not tight, so that the soft-tissue contours remained unchanged. For both the axillary and xiphoid process measurements the subjects were asked to perform maximum inspiration and maximum expiration.[2] Three trials were performed and the best value was recorded. After the chest expansion measurement, PEFR values were taken immediately.PEFR was done by the following procedure. The PEFR meter is set to zero. The subject was made to sit and was informed to take a deep breath and was instructed to place the mouth around the mouthpiece of PEFR meter. The subject is instructed to exhale as forcefully as possible.[10]Three trials were performed and the best value was recorded. Both the values of chest expansion and PEFR were noted.

Figure 1

Figure 2

OUTCOME MEASURES

- Chest expansion values
- PEFR values

DATA RECORDING CHART

NO.	NAME	AGE	GENDER	CHEST EXPANTION VALUES		PEFR VALUES(L/min)
				Axillary level(cm)	Xiphoid level (cm)	
1						
2						

RESULTS

Chest Expansion Axillary level value(cm)

TOTAL	MEAN	Standard Deviation
100	3.1650	1.3615

Mean values of 100 construction workers at Axillary level were 3.1650

Chest Expansion Xiphoid level value(cm)

TOTAL	MEAN	Standard Deviation
100	3.1700	1.6147

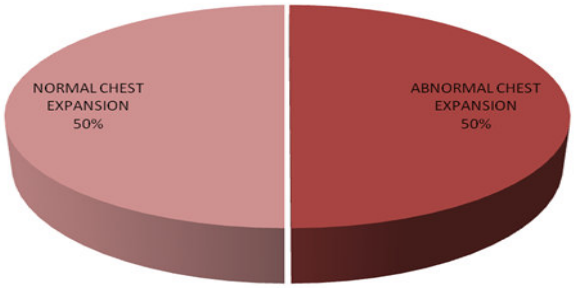
Mean values of 100 construction workers at Axillary level were 3.1700

TOTAL *PEFR value(L/min)*	MEAN	Standard Deviation
100	357.1000	94.722

Mean PEFR values of 100 construction workers were 357.00

GRAPH NO.1

Normal and abnormal chest expansion values



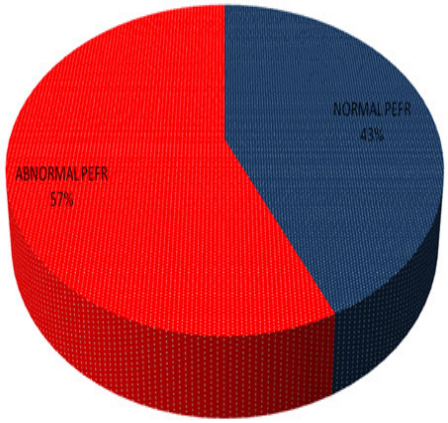
ABNORMAL CHEST EXPANSION	
ABNORMAL CHEST EXPANSION	50%
NORMAL CHEST EXPANSION	50%

INTERPRETATION

As the graph shows 50% construction workers have abnormal chest expansion. And 50% have normal chest expansion.

GRAPH NO.2

Normal and abnormal PEFR values



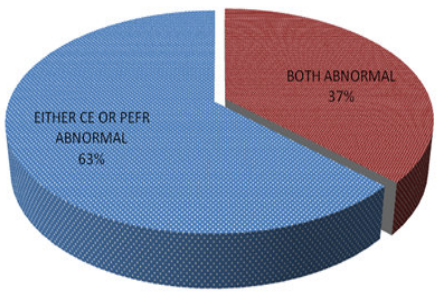
ABNORMAL PEFR	
ABNORMAL PEFR	57%
NORMAL PEFR	43%

INTERPRETATION

As the graph shows 57% construcion workers have abnormal PEFR value and the 43% construction workers have abnormal PEFR value.

GRAPH NO.3

Both chest expansion and PEFR abnormal values



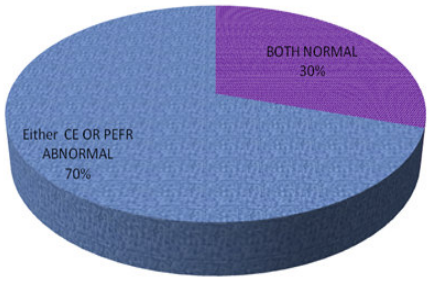
BOTH CHEST EXPANSION ABNORMAL	
BOTH ABNORMAL	37%
EITHER CE OR PEFR ABNORMAL	63%

INTERPRETATION

The graph shows 37% construction workers have chest expansion and also PEFR values are abnormal. And the 63% construction workers have either chest expansion or PEFR abnormal.

GRAPH NO.4

Both chest expansion and PEFR Normal values



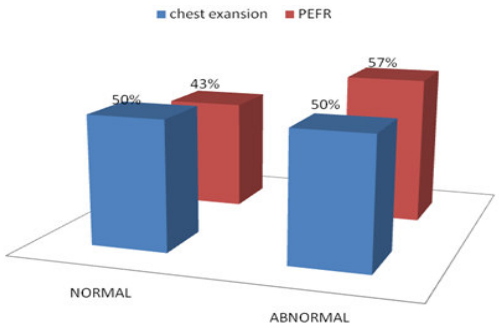
BOTH CHEST EXPANSION NORMAL	
BOTH ABNORMAL	30%
EITHER CE OR PEFR ABNORMAL	70%

INTERPRETATION

The graph shows 0nly 30% construction workers have both chest expansion and PEFR abnormal. And 70% have construction workers have either chest expansion or PEFR values abnormal.

GRAPH NO.5

Chest expansion and PEFR values

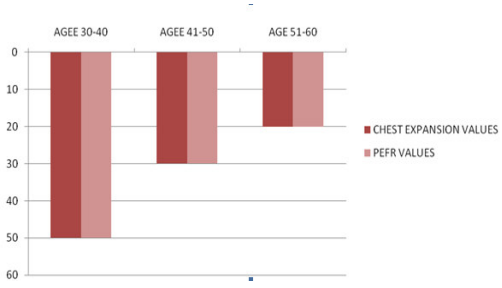


INTERPRETATION

The graph shows 50% construction people have normal chest expansion values and 50% have abnormal chest expansion values and 57% workers construction workers have abnormal PEFR values and 43% have normal PEFR values.

GRAPH NO.6

Correlation between age and chest expansion, pefr values



INTERPRETATION

Graph shows as the age increases the chest expansion value and peak expiratory rate values are decreased.

DISCUSSION

Chest expansion measurements are used to evaluate a patient's baseline status, treatment ffectiveness, and progression of disease with regards to chest wall mobility and respiratory muscle function.[1]Peak expiratory flow rate (PEFR) is the maximum flow rate generated during a forceful exhalation, starting from full lung inflation. Peak flow rate primarily reflects large airway flow and depends on the voluntary effort and muscular strength of the patient. Maximal airflow occurs during the effort-dependent portion of the expiratory maneuver, so low values maybe caused by a less than maximal effort rather than by airway obstruction.The construction workers are more exposed to cement and sand. Continuous inhalation of cement and silica is harmful to lungs. In this respect, the construction workers are at more prone to continuous exposure to cement and silica due to the nature of their job. According to many studies prevalence of restrictive, obstructive & mixed type of functional impairment of lung was found to have direct relationship with concentration of cement and silica. Exposure to respirable crystalline silica dust during construction activities can cause serious and fatal respiratory disease.The national institute for occupational safety and health (NIOSH) requests assistant in preventing silicosis and death in construction workers exposed to respirable silica, when workers inhale crystalline silica, the lung tissue react by developing fibrotic nodules and scarring around the trapped silica particles.[6,7] In the study inspiratory capacity of construction workers were reduced, due to this chest expansion was reduced.In our study as the age increases chest expansion and PEFR values were reduced. This is due to as the age increases biomechanical changes occur. Skeletal changes that occur with aging may affect pulmonary function. The costal cartilages ossify, which interferes with their axial rotation. The articulations of the chest wall undergo fibrosis. The interchrondal and costochondral joints fibrose with increasing age. The chondrosternal joints get obliterated with age and xiphisternal junction usually ossifies after 40 years of age. Overall chest wall compliance is significantly reduced with age.[8]As the age increases, the lung tissue decreases in elasticity. An increases kyphosis is observed, which decreases the mobility of thoracic spine and rib cage. The results of the skeletal and tissue changes causes an increase in functional residual capacity and decrease in inspiratory capacity of the thorax.[8] This may be the reason of decrease in chest expansion values of construction workers of above 40 years of age. Overall as the age increases,there is loss of strength,fewer muscle fibers,lower oxidative capacity,decrease in the number of size of fast twitch type II fibers and decreased compliance of the respiratory system.[8]Construction workers are more exposed to dust and sand particles which most commonly lead to pneumoconiosis. Pneumoconiosis is a lung disease caused by inhalation of dust, therefore, also called as dust disease or occupational disease. In this disease particles reaching to alveoli are taken by the macrophages which undergo necrosis to respirable crystalline silica dust during construction activity can cause serious or fatal respiratory disease. The national institute for occupational safety & health (NIOSH) requests assistance in preventing silicosis & deaths in construction worker, co workers, managers, & equipment manufacturers urgently need information about the hazards of breathing respirable crystalline silica. Assistance in this effort will help to prevent silicosis-related death & disease, a national goal for health promotion & disease prevention states in healthy people 2000 [PHS 1990]. Exposure to construction- Concrete and masonry products contain silica sand & rock. Since these products are primary materials for construction, construction workers may be easily exposed to respirable crystalline silica during activities such as the following

- Chipping, hammering, hauling and drilling of rock
- Crushing, loading, hauling, and dumping of rock.
- Abrasive blasting using silica sand as the abrasive
- Abrasive blasting of concrete (regardless of abrasive used)
- Sawing , hammering , drilling , grinding & chipping of concrete or masonry structures.
- Demolition of concrete and masonry structures.
- Dry sweeping or pressurized air blowing of concrete, rock , or sand dust

Even materials containing small amount of crystalline silica may be hazardous if they are used in way that produce high dust concentration That's way we can give advice to used mask when doing work. As a result of the above mentioned factors, chest expansion and PEFR values were reduced in construction workers. Due to reduced chest expansion in construction workers, Physiotherapy intervention can be incorporated to improve chest expansion for the future scope of the study. Physiotherapy treatment can be given in the form of thoracic expansion exercises and Incentive spirometry in the acute stage to improve lung expansion.

CONCLUSION

The mean values of Chest expansion of 100 construction workers at Axillary level and Xiphoid level were 3.1650 and 3.1700 respectively. The mean Peak expiratory flow rare value was 357.So the overall interpretation of the study was that 50% construction workers have abnormal chest expansion and 50% have normal chest expansion values.The 57% construction workers have abnormal PEFR value and 43% have normal PEFR value.63% of construction workers have both chest expansion and PEFR value abnormal.And only 30% construction workers have both normal.As the age increases Chest expansion and PEFR values were reduced.

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CONFLICT OF INTEREST

Conflict of interest declared none

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